

An Abalone Lacking Respiratory Apertures

by

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(Plate 9)

The discovery of a juvenile red abalone, *Haliotis rufescens* Swainson, 1822, characterized by a complete absence of respiratory apertures seems worthy of a published note. The imperforate specimen was collected together with a number of normal specimens on a beached kelp holdfast [*Macrocystis pyrifera* (Linn.) Agardh, 1771] at Pacific Beach, California, in October, 1959 (Figure 1, top). Normally, a pallial cleft develops and aperture formation commences when the juvenile abalone is approximately two millimeters long. Dissection of this specimen, however, revealed that no cleft had been formed in the mantle. The general perfect condition of shell and body tissue lends support to the interpretation that the absence of apertures and pallial cleft is the result of mutation rather than local injury.

Specimens of various abalone species have been collected which apparently had lost the ability to create apertures. In all cases, however, the cessation of aperture formation was found to have been brought about by a mechanical injury to the mantle and shell. In such specimens apertures had been formed in the young stages but were not formed subsequent to injury. Observation of this phenomenon in occasional specimens of the black abalone has led some investigators to describe subspecies of the form (Keep, 1935). *Haliotis cracherodii holzneri* Hemphill, 1907, and *H. c. imperforata* Dall, 1919, are two of the so-called subspecies appearing in older literature (Abbott, 1954).

Prosobranch gastropods possessing respiratory apertures or slits (archaeogastropodan families Pleurotomaridae, Scissurellidae, Haliotidae, and Fissurellidae) are considered primitive types (Yonge, 1947). These gastropods create a water current which enters the mantle cavity from beneath the shell and which, after bathing the gills and picking up wastes or sex products, leaves via the respiratory apertures. An abalone lacking apertures must elevate the shell considerably to maintain a respiratory current. A mutation of the kind responsible for the loss of the ability to create apertures through the disappearance of the pallial cleft may have provided the necessary step leading to the evolution of the more advanced non-apertured gastropods.

LITERATURE CITED

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1954. American seashells. D. Van Nostrand Co., Inc., New York.
- Keep, J. and J. L. Baily, Jr.
1935. West Coast shells. Stanford University Press, Stanford, California.
- Yonge, C. M.
1947. The pallial organs in the Aspidobranch Gastropoda and their evolution throughout the mollusca. Philosoph. Trans. of the Royal Society. Ser. B, vol. 232, pp. 443-518.

Explanation of Plate 9

Figure 1: Imperforate shell of *Haliotis rufescens*.

Figure 2: Foot and viscera of the same specimen.

Figure 3: Normal shell of the same species of abalone.

Figure 4: Foot and viscera of the normal specimen. Note the pallial cleft (arrow). It is non-existent in the imperforate specimen. All figures on the left are from black and white photographs, while those on the right are from color photographs. Illustrations four times natural size.